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ON A SUPPOSED FRUIT OR NUT FROM THE TERTIARY OF ALASKA.

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In the summer of 1910, Dr. George F. Kay, while engaged in a study of the Bering River Coal Field of southeastern Alaska, discovered some subspherical, concretion-like bodies in the "shales of the Tokun formation." Three specimens were brought back by Professor Kay and these through his kindness have been submitted to the writer for study. The largest is a smooth oval body with long and short diameters of 8.6 and 7.6 centimeters; the smallest is likewise smooth, irregularly oval, and with diameters of 4.3 and 3.8 centimeters. All three are dark-colored, compact, close-grained stone, brittle under the hammer, and fairly heavy. The smallest one has a core largely made up of iron pyrites while the largest one, though moderately heavy, apparently lacks this mineral and is uniformly dark and dense throughout. The third specimen, though perhaps less heavy, is much like the largest in its physical properties. Its surface, however, is rougher and is partly covered by remnants of an outer coat about six millimeters in thickness. Due to the strikingly nut- or fruit-like appearance of the specimen this cover is here termed an "epicarp." The patches of the epicarp are of a brownish color on their broken edges but are darker brown on their smooth outer surfaces. The epicarp is softer, too, and more porous than the main body of the "fruit." The polar diameter (see below) of this specimen is 6.6 centimeters and two equatorial diameters measure 7.3 and 7.6 centimeters, exclusive in each case of the cortex-like epicarp. The specimen weighs seventeen and one-half ounces and its specific gravity is approximately 2.6.

The most remarkable feature of the specimen is that it is marked longitudinally by four "meridians" which appear as shallow depressions on the surface except on a part of the hemisphere which better preserves the epicarp; here a meridian is represented for a part of its length by a low ridge. In no case where the meridians pass under the patches of epicarp is there any evidence either in or on the latter of their presence. The

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four meridians instead of converging to a common point are disposed in two pairs; the members of each pair are joined at their polar extremities and the two pairs in turn are connected at each pole by a short shallow rectilinear depression which is similar to the meridional depressions. These two short diametrically-separated linear depressions may be called polar lines. They are of unequal length,—one being 7.1 and the other 4.5 millimeters long. The midpoint of each line may be regarded as the mathematical terminus of the polar diameter or axis of the specimen. The two polar lines are parallel to each other.

This arrangement of the meridians and the short connecting lines across the poles divides the spheroidal body into tetrahedral parts. It is evident that the sum of the angles between the meridians (produced if necessary) at the poles equals 360 degrees. The four angles about either pole differ greatly in size but corresponding angles at opposite poles have approximately the same magnitude. See Plate V, figures 1, 2.

In an attempt to saw through the specimen along the equatorial plane the pressure of the vise caused it to break into two parts. The break, or rather cleft, followed two opposite meridians as far as the ends of the polar lines whence the cleft followed a narrow axial rectangular plane which terminates in these lines. After this mishap no further effort to cut the specimen was made since the break reveals no suggestion of internal structure other than that just described. It is admitted, however, that if the specimen is a fruit and if the parts are preserved, that the critical structures are within the "quarters" limited by the meridians.

From the manner in which the specimen parted when under the pressure of the vise it would appear that planes of weakness are present and that these extend inward from the meridional lines and possibly suggest that the specimen is a concretion or a part of a concretion of the type of some of the septaria or turtle stones. Moreover, the fact that the other two specimens brought in from the same formation are doubtless concretionary adds weight to the hypothesis that the third specimen also may be of the same origin.

On the other hand the tetrahedral division, the fragments of what may represent an epicarp, and the precise arrangement of the meridional and polar lines strongly suggest a four-celled ovary protected by an indehiscent epicarp while the meridional lines may represent the distal edges of septa between the seed cells. Attention is called to the point that the structure here designated as "epicarp" may be, at least in part, the wall of the ovary. Whether the plant (if plant it was) to which it belonged was terrestrial or aquatic in habitat we can only conjecture. The variable beds of the marine Tokun formation and of the subjacent, coal-bearing, non-marine Kushtaka formation[1] indicate a variety of habitats in the region in Tertiary times.

The specimen was shown to Dr. R. P. Baker of the department of mathematics at the University. In his opinion "the chances are enormously against its being of mechanical origin and we should look rather to an organic derivation for so symmetrical an object."

It is hoped that students of paleobotany who may see this note will communicate their opinions should they in their wider experiences have encountered similar material. Likewise any suggestions from those who have studied concretions and their mode of formation will be gratefully received.

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[1] Iowa Academy of Science, Vol. XVIII, p. 88, 1911; also U. S. Geol. Survey Bull. 335, pp. 31-36, 1908.

EXPLANATION OF PLATE V.

Figures approximately natural size.

Figure 1. Diagram showing the relation of the meridians to the longer polar line. The approximate magnitudes of the angles *a*, *b*, *c* and *d*, lettered clockwise, are 86°, 88°, 80°, and 106° respectively.

Figure 2. The same as figure 1 about the shorter polar line. Angles *a'*, *b'*, *c'* and *d'*, lettered counter-clockwise, equal 86°, 90°, 78½° and 106° respectively.

Note that angle *a*, fig. 1, and angle *a'*, fig. 2, are on opposite ends of the same "quarter"; angle *b* is opposite *b'*, etc. Their values in each case are nearly the same.

Figure 3. Polar view of the specimen showing the meridians joining the longer polar line. The cleft follows the upper left hand meridian rather closely, then the polar line, and down the lower left hand meridian. It follows the last two lines and the planes extending in from them precisely.

Figure 4. The opposite polar view. The cleft follows the upper right hand meridian, the polar line, and the lower left hand meridian.

Fragments of the "epicarp" may be seen on both 3 and 4.

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